Listing of Claims

1-4 Canceled

5. (Currently Amended) A multi-channel PWM (Pulse Width Modulator) apparatus, comprising:

a plurality of pulse width modulators for modulating audio signals into PWM-based multi-channel audio signals; and

a gain control unit, connected to the plurality of pulse width modulators, for independently controlling gains of the audio signals received at the plurality of pulse width modulators, wherein the gain control unit independently controls gains of at least a portion of the audio signals to be at different levels according to individual channels, the gain control unit controlling gains of at least the portion of the audio signals so that control of the gain of each of the portion of audio signals is not limited by control of the gain of the other audio signals.

6. (Previously Presented) The apparatus as set forth in claim 5, wherein the gain control unit comprises:

a plurality of gain controllers, each varying a level of a respective audio signal of the multi-channel audio signals received at a corresponding one of the pulse width modulators;

a plurality of comparators, each coupled to an output of a corresponding one of the gain controllers, that compare levels of audio signals generated from the gain controllers with a reference level;

AGC (Automatic Gain Controller) configured to receive output signals of the comparators for variably controlling the gain controllers according to individual output signals of the comparators; and

a plurality of adders that perform addition or subtraction operations based on control signals generated from the AGC and volume control signals for said channels, and independently varying gains for said channels based on results of the addition or subtraction operations,

wherein each of the adders receives two input signals being a corresponding volume control signal and a corresponding control signal from the said AGC for a respective one of the channels, and outputs an independent gain control signal to a corresponding one of the.

7. (Previously Presented) The apparatus as set forth in claim 6, wherein a number of the gain controllers, the comparators, or the adders is identical to a number of channels of the pulse width modulators.

8. (Previously Presented) The apparatus as set forth in claim 7, wherein the plurality of pulse width modulators receive a reference signal, and wherein the gain control unit controls gains of the audio signals when the reference signal indicates an overload condition.

9. (Canceled)

10. (Previously Presented) The apparatus as set forth in claim 8, wherein the pulse width modulators include six pulse width modulators for PWM-modulating PCM-based six-channel audio signals read from an optical disc while being classified according to individual channels.

11. (Previously Presented) The apparatus as set forth in claim 5, comprising:

a controller for independently turning on/off the plurality of pulse width modulators according to individual channels.

12. (Previously Presented) The apparatus as set forth in claim 11, wherein the controller includes a number of AND gates for selectively enabling or disabling a same number or a subset of pulse width modulators, each of the AND gates receiving an overload condition signal for compulsorily tuning off one or more of the pulse width modulators when a value of system load is higher than a reference value and a PWM on/off control signal for every channel for turning on/off the pulse width modulators according to a user's key signal or an optical disc

type, each AND gate performing an AND operation between the overload condition signal and the PWM on/off control.

13. (Currently Amended) An audio/visual receiver, comprising:

a reader configured to output a first data signal based on information stored in a recording medium;

a tuner configured to output a second data signal;

a decoder coupled to the reader configured to decode the data signals into audio signals;

a pulse width modulator device, configured to modulate the audio signals into PWM-based multi-channel audio signals, that comprises,

a plurality of pulse width modulators configured to modulate the audio signals into the PWM-based multi-channel audio signals; and

a plurality of signal controllers coupled to the plurality of modulators to independently control at least one of input signals and output signals of the plurality of pulse width modulators, wherein the plurality of signal controllers comprise a plurality of gain controllers that each receive one of the audio signals received for a corresponding one of the plurality of pulse width modulators, wherein the gain controllers independently control gains of at least a portion of the received audio signals to be at different levels according to individual channels, the gain controllers controlling gains of at least the portion of the received audio

signals so that control of the gain of each of the portion of received audio signals is not limited by control of the gain of other received audio signals; and

at least one speaker configured to receive and output the PWM-based multi-channel audio signals.

14. (Original) The receiver of claim 13, wherein the plurality of signal controllers comprise a plurality of phase shifters that phase-shift modulated output signals received from the pulse width modulators.

15. (Canceled)

16. (Previously Presented) The receiver of claim 14, wherein the plurality of signal controllers comprise a plurality of controllers that independently enable the plurality of pulse width modulators according to individual channels.

17. (Canceled)

18. (Original) The apparatus of claim 13, wherein the plurality of signal controllers comprise a plurality of controllers that independently turn on/off the plurality of pulse width modulators according to individual channels.

19. (Currently Amended) A multi-channel PWM (Pulse Width Modulator) apparatus, comprising:

a plurality of pulse width modulators configured to modulate audio signals into PWM-based multi-channel audio signals; and

a plurality of signal controllers coupled to the plurality of modulators for controlling at least one of input signals and output signals of the plurality of pulse width modulators, wherein the plurality of signal controllers comprise a plurality of phase shifters for phase-shifting modulated output signals received from the pulse width modulators,

wherein the plurality of signal controllers comprise a plurality of gain controllers for receiving the audio signals received at the plurality of pulse width modulators, wherein the gain controllers independently control gains of at least a portion of the received audio signals to be different according to individual channels of the pulse width modulators, the gain controllers controlling gains of at least the portion of the received audio signals so that control of the gain of each of the portion of received audio signals is not limited by control of the gain of the other received audio signals, and

wherein the plurality of signal controllers further comprise a plurality of controllers for independently turning on/off the plurality of pulse width modulators according to said individual channels, while audio signals are being received at said PWM apparatus.

20-26 (Canceled)

27. (Currently Amended) An audio/visual receiver, comprising:

a reader configured to output a first data signal based on information stored in a recording medium;

a tuner configured to output a second data signal;

a decoder coupled to the reader configured to decode the data signals into audio signals;

a pulse width modulator device configured to modulate the audio signals into PWM-based multi-channel audio signals that comprises,

a plurality of pulse width modulators configured to modulate the audio signals into the PWM-based multi-channel audio signals; and

a plurality of signal controllers coupled to the plurality of modulators to independently control at least one of input signals and output signals of the plurality of pulse width modulators, wherein the plurality of signal controllers comprise a plurality of controllers that independently enable the plurality of pulse width modulators according to individual channels, and wherein:

the pulse width modulators comprise N pulse width modulators for PWM-modulating PCM-based N-channel audio signals read from the recording medium while being classified according to individual channels, wherein the controllers include N AND gates for selectively enabling all the N ~~six~~ pulse width modulators or a subset of pulse width modulators from among the N ~~six~~ pulse width modulators, where N is an integer such that $N \neq 0$, and

the AND gates each receive an overload condition signal for compulsorily turning ~~tuning~~ off the pulse width modulators when a value of system load is higher than a reference value, and PWM on/off control signals for every channel for turning on/off the pulse width modulators according to a user's key signal or an optical disc type, and performing an AND operation between the overload condition signal and the PWM on/off control signals.

28. (Canceled)

29. (Previously Presented) The receiver of claim 27, further comprising:

a gain control unit that receives the audio signals and independently controls gains of at least a portion of the received audio signals to be different according to individual channels.

30. (Previously Presented) The apparatus as set forth in claim 29, wherein the gain control unit comprises:

a plurality of gain controllers;

a plurality of comparators, each coupled to a corresponding one of the gain controllers to compare a level of an audio signal generated from one the gain controllers with a reference level;

AGC (Automatic Gain Controller) configured to receive ~~all~~ output signals of the comparators for variably controlling the gain controllers according to individual output signals of the comparators; and

a plurality of adders that perform addition or subtraction operations based on control signals generated from the AGC and volume control signals for each channel, and independently varying gains for said each channel

wherein each of the adders receives two input signals being a corresponding volume control signal and a control signal from the said AGC for a corresponding one of the channels and outputs an independent gain control signal to a corresponding gain controller.

31. (Previously Presented) The apparatus as set forth in claim 5, wherein the gain control unit includes a plurality of gain controllers, each independently controlling a gain of audio signals received at a respective one of the pulse width modulators.

32. (Previously Presented) The apparatus as set forth in claim 5, wherein the gain control unit independently controls a first number of the audio signals to be at a first level and a second number of the audio signals to be at a second level.

33. (Previously Presented) The apparatus as set forth in claim 32, wherein the first number is greater than one and the second number is greater than one.

34. (Previously Presented) The apparatus as set forth in claim 5, further comprising:

a controller to selectively turn off one or more of the pulse width modulators when a predetermined condition is detected.

35. (Previously Presented) The apparatus as set forth in claim 5, wherein the predetermined condition is an overload condition.

36. (Previously Presented) The apparatus as set forth in claim 5, further comprising:

a controller to independently control phases of the audio signals,

wherein the second controller adjusts phases of at least a portion of the audio signals to be different.